forming a barrier metal layer on the sides and bottom of damascene trench;

embedding a metal film in said damascene trench; and

forming an anti-oxidizing film on said metal film.--

REMARKS

A petition for a two month extension of time has today been filed as a separate paper and a copy is attached hereto.

Allowable dependent claims 9, 10 and 12, have been rewritten as independent claims 40, 41 and 42, respectively, to address the objections made by the examiner. Further, claim 11 has been amended to depend from claim 41. Accordingly, all of claims 11, 40, 41 and 42 are believed allowable.

Therefore, it is believed that only rejected claims 1, 3-8 and 13 remain at issue. The rejection of these claims over Vines et al "taken with Kapoor" is again traversed.

The examiner will note that each recitation of "film" in claim 1 has been amended to read "SiO_2 film". This is considered a clarification in that the fact that the initially formed film is an SiO_2 film necessarily follows from the definition of the source gas and the definition of the product as a "porous SiO_2 film." However, claim 1 has been further amended to define the annealing step as applied to the film "as formed in step (1)", thereby excluding any intervening step which would in

any way change the nature of the film formed in step (1). Further, step (1) has been further amended to define the annealing step as being conducted in the presence of an oxygen gas or an oxygen plasma. See, for example, page 17, lines 8 and 9 and page 13, lines 10-15 of applicants' original specification.

Applicants recognize that Kapoor teaches annealing in an oxidative gas for the generation of gaseous products within the insulation material which, driven therefrom, leave behind a porous structure. Applicants do not contest that such porosity is advantageous for the purpose taught by Kapoor. However, the examiner has taken the position that it would have been obvious from those teachings of Kapoor to modify the process taught by the primary reference, i.e., Vines et al, in a manner that it is compatible both with the gist of what Vines et al regard as their invention and with the whole purpose of Vines et al in making their invention.

The gist of the Vines et al invention is a two-step annealing for densification of "an intermetal dielectric layer" (IMD), i.e., a vacuum bake followed by an oxidation anneal. Applicants' claims as amended exclude any intervening vacuum bake step and to delete same from Vines et al is to reduce the annealing of Vines et al to a single step which is quite different from what Vines et al describe as their invention.

Vines et al clearly teach that the purpose of their two-step annealing is "to provide densification of the dielectric layer," quoting from column 2, lines 39 and 40. Conversion of solid phase into gas containing pores, in accordance with the teachings of Kapoor is the opposite of

densification. An increase in porosity necessarily gives a less dense mass. Accordingly, it is believed that the examiner's statement "the desired porosity and densification however are not mutual [sic., mutually] exclusive" is believed to be clearly erroneous.

The examiner further writes "Vines et al do not preclude porosity from the film." As noted above, the subject of the process of Vines et al is an IMD layer. See, for example, column 1, lines 13-16 and column 2, lines 32-34 of Vines et al. To convert that layer to a porous structure in accordance with the teachings of Kapoor in is completely contrary to the densification objective of Vines et al. Also note the teaching at column 1, lines 29-31 of Vines et al which reads:

> It is critical that an IMD layer be free of voids or holes which would cause unwanted shorting between conductive layers. [Emphasis added]

Again, the manner in which the examiner would modify the teachings of the primary reference are completely contrary to the above-quoted teaching and would serve to eliminate everything which Vines et al regard as their invention. That would not have been obvious. The modification of a primary reference in a manner so at odds with its gist and whole purpose can only be a hindsight approach to the issue.

In conclusion, it is respectfully requested that the examiner reconsider the rejection of record with a view toward allowance of those claims not previously allowed.

Respectfully submitted,

George A. Loud
Reg. No. 25,814

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LORUSSO & LOUD
3137 Mount Vernon Avenue
Alexandria, VA 22305

(703) 739-9393

1. (Twice Amended) A method for forming an interlayer insulating film comprising the steps of:

(1) forming a SiO_2 film containing boron, carbon and H_2O on a substrate by plasma enhanced chemical vapor deposition using a source gas containing an Si-C-O-H compound, an oxidative gas and a compound containing boron; and

(2) annealing said SiO_2 film as formed in step (1) while said SiO_2 film is in contact with oxygen gas or an oxygen plasma to release [, releasing] carbon and H_2O [contained in said film] from said SiO_2 film, and thereby convert [converting] said SiO_2 film into a porous SiO_2 film containing boron.

11. (Amended) A method according to claim 41 [10], wherein said side wall insulating film is formed by the steps of:

forming said damascene trench and then forming a first insulating film on said interlayer insulating film, on the sides of said damascene trench and on a bottom of said damascene trench; and

anisotropically etching said first insulating film to such an extent that said first insulating film formed on the sides of said damascene trench remains and said first insulating film formed on the bottom of said damascene trench is removed.